



DEPARTMENT OF AGRICULTURE,  
CEYLON.

---

BULLETIN No. 61.

# FOREST SOILS OF CEYLON.

BY

ALEXANDER BRUCE, B.Sc., F.R.S.E.

---

Peradeniya,  
February, 1923.

---

COLOMBO:  
H. ROSS GUNATILLAKE, GOVERNMENT PRINTER, CEYLON.  
1923.

## DEPARTMENT OF AGRICULTURE.

### *Administrative:—*

Hon. Mr. F. A. SPOCKDAL, M.A., F.L.S. Director of Agriculture.  
R. ALUWIHARE .. .. . Office Assistant.  
R. H. PERERA .. .. . Chief Clerk.

### *Research—Laboratories:—*

T. PITCH, B.A., B.Sc. .. .. . Botanist and Mycologist.  
J. C. HUTTON, B.A., Ph.D. .. .. . Entomologist.  
R. O. LUFFS, B.A. .. .. . Economic Botanist.  
M. K. BAMBER, M.R.A.C., F.I.C., F.O.S. Agricultural Chemist.  
G. BRYCE, B.Sc. .. .. . Assistant Botanist and Mycologist.  
O. H. GADD, B.Sc. .. .. . Assistant Mycologist.  
F. P. JEPSON, M.A., F.R.S. .. .. . Assistant Entomologist.

### *Research—Plant Pests and Disease Inspectors:—*

N. K. JARDINE, F.R.S. .. .. . Inspector for Plant Pests and Diseases, Central.  
A. T. REEVE, A.R.C.S. .. .. . Inspector for Plant Pests and Diseases, Southern.

### *Research—Experiment Stations:—*

H. A. DENTON .. .. . Manager, Experiment Station, Peradeniya (acting).  
*Agricultural Branch:—*  
G. G. AUCHINCLOSS, M.Sc., A.I.C., F.O.S. Divisional Agricultural Officer, Central.  
T. H. HOLLAND, Dip., Agr., Wye. .. .. . Divisional Agricultural Officer, Northern (acting).  
G. HARBORD .. .. . Divisional Agricultural Officer (on leave).  
F. BURNETT, B. Agr. .. .. . Divisional Agricultural Officer, Southern.  
V. CANAGARATNAM .. .. . Manager, Experiment Station, Anuradhapura (acting).

### *Gardens Branch:—*

H. F. MACMILLAN, F.R.H.S., F.L.S. .. .. . Superintendent of Botanic Gardens.  
T. H. PARSONS .. .. . Curator, Royal Botanic Gardens, Peradeniya.  
J. J. NOCK .. .. . Curator, Hakgala Gardens.

## BOARD OF AGRICULTURE.

### EXECUTIVE COMMITTEE.

His Excellency the Governor, <i>President</i> .	The Hon. Mr. O. C. Tillekaratne.
The Hon. the Colonial Secretary, <i>Vice-President</i> .	The Hon. Lieut.-Colonel T. Y. Wright.
The Hon. the Controller of Revenue.	Mr. R. G. Coombe
The Director of Agriculture.	Mr. W. A. de Silva.
The European Rural Member of Council.	Mr. J. B. Coles.
The Hon. Sir H. M. Fernando, M.D., B.Sc.	Mr. C. E. A. Dias.

*Secretary* : Mr. R. Aluwihare

### *Ex Officio Members.*

The Government Agent, Western Province.	The Government Agent, Northern Province.
The Government Agent, Central Province.	The Government Agent, North-Western Province.
The Government Agent, Southern Province.	The Director of Irrigation.

### ESTATE PRODUCTS COMMITTEE.

The Director of Agriculture ( <i>Chairman</i> ).	Mr. E. W. Keith.
The Hon. Mr. H. L. de Mel, C.B.E.	Mr. A. S. Long-Price.
The Hon. Mr. J. Graeme Sinclair.	Mr. A. C. Mathew (on leave), Mr. W. R. Mathew (acting).
The Hon. Mr. James Peiris.	Mr. T. A. de Mel.
Sir S. D. Bandaranayake, C.M.G.	Mr. J. W. Oldfield.
The Chairman, Planters' Association of Ceylon.	Mr. Graham Pandittasekera.
The Chairman, Low-country Products Association.	Mr. J. S. Patterson.
Mr. A. J. Austin Dickson.	Mr. L. H. S. Pieris.
Lieut.-Col. L. Bayly.	Mr. A. B. Rajapakse, Gate Mudaliyar.
Mr. A. W. Ewen.	Mr. F. R. Senanayake.
Mr. George Brown.	Mr. N. D. S. Silva.
Mr. D. S. Cameron.	Mr. S. B. Hamer.
Mr. N. G. Campbell.	Mr. A. P. Waldoock.
Mr. J. B. Coles.	Mr. M. L. Wilkins.
Mr. R. G. Coombe.	The Hon. Lieut.-Col. T. Y. Wright.
Mr. C. E. A. Dias.	Mr. M. Kaiway Bamber, Government Agricultural Chemist.
Mr. B. Garnier.	The Botanist and Mycologist.
Mr. H. D. Garrick.	The Entomologist.
Mr. A. P. Goonetilleke.	The Assistant Botanist and Mycologist.
Dr. C. A. Hewavitharna.	The Assistant Entomologist.
Lieut.-Col. T. G. Jayawardene.	

*Secretary* : Mr. H. A. Denton (acting).

*For Food Products Committee see page 2 of cover.*

DEPARTMENT OF AGRICULTURE, CEYLON.

BULLETIN No. 61.

FOREST SOILS OF CEYLON.

By ALEXANDER BRUCE, B.Sc., F.R.S.E.

INTRODUCTION.



ALTHOUGH a large number of estate or cultivated soils have been examined, there has been no systematic examination of Ceylon forest soils. Estates have had their origin from forest, jungle, chena, or patanas, and in many cases have been in cultivation for half a century or more under different products. In the past, estate soils did not get the attention they get to-day in the way of forking, draining, green manuring, and intensive cultivation, the result is that many areas lost valuable tilth by wash caused by heavy rains, high in intensity and total precipitation. The soils from the forest areas of to-day represent the soils of yesterday from which Ceylon agriculture owes its origin, and gives one an idea what the cultivated soils were similar to prior to felling.

It is also hoped that the results of the examination of the forest soils will be of interest and use to the Forest Department, considering the interest at present being taken in Forest science and re-forestation schemes, the present demand for timber, and the probable greater demand in the future throughout the Empire.

In all fifty-two samples of soil were examined from the Southern, Sabaragamuwa, Central, North-Central, North-Western, Uva, and Eastern Provinces. Details of rainfall, elevation, varieties of forest growth were also obtained.

Samples of soil were collected by the forest officers, to a depth of 2 feet. These samples were examined by the standard method adopted by the Committee of Agricultural Education Association.

# Southern Province.

	Narendiya Range.						Galle Range.				Matawa Range.				Morawa Range.				Hambapola Range.						
	Boreallyakotte P. R.		Milundakanda P. R.		Polhunawa P. R.		Kotawa Forest.		Bulawala Forest.	Kannallya Forest.	Berallya Forest.	Maamulla Forest.	Kekandura Forest.	Malawiyalambela Forest.	Mulatiyankakole Forest.	Ketiabagamala-hema.	Mahapikandanda Forest.	Kattakadawa Forest.	Bolina Forest.						
	Inside.	Out-side.	Inside.	Out-side.	Inside.	Out-side.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
<i>Mechanical Composition.</i>																									
Hygroscopic moisture and salts	3.40	3.90	3.00	2.80	0.30	1.50	2.10	2.10	2.10	1.70	2.30	3.70	2.30	1.50	2.10	3.20	2.10	2.60	3.40	3.40	2.10	2.60	2.60	3.00	
Humus	6.70	2.80	9.00	2.80	3.80	2.20	2.20	2.20	2.20	2.50	3.50	3.20	2.80	3.40	1.90	3.00	2.60	2.60	3.40	3.40	2.60	2.60	2.60	3.00	
Humus	11.10	9.10	30.20	10.90	4.80	10.00	9.50	11.10	4.80	6.80	23.00	9.30	13.50	13.50	9.00	12.80	8.90	8.90	13.50	13.50	9.00	8.90	8.90	10.50	
Fine silt	5.00	5.00	6.00	4.40	3.90	7.10	8.00	4.30	7.20	7.20	9.20	5.20	9.00	9.00	9.00	10.50	6.70	6.70	9.00	9.00	10.50	6.70	6.70	7.80	
Silt	24.00	20.10	25.00	19.50	10.70	26.70	17.50	11.00	37.00	37.00	13.90	15.20	28.50	11.00	10.30	15.40	19.50	19.50	28.50	28.50	15.40	19.50	19.50	27.20	
Fine sand	35.90	48.10	51.60	33.80	28.10	24.80	24.80	26.70	26.70	27.60	19.40	14.80	19.40	38.10	39.00	24.00	32.80	32.80	38.10	39.00	24.00	32.80	32.80	34.80	
Coarse sand	35.00	35.00	31.30	37.80	6.53	31.00	42.00	45.00	15.65	49.70	21.40	8.02	28.75	8.70	5.83	21.40	16.21	16.21	8.70	5.83	21.40	16.21	16.21	1.43	
Fine gravel	35.00	35.00	31.30	37.80	6.53	31.00	42.00	45.00	15.65	49.70	21.40	8.02	28.75	8.70	5.83	21.40	16.21	16.21	8.70	5.83	21.40	16.21	16.21	1.43	
Water absorption	35.00	28.00	36.50	31.00	39.00	31.00	42.00	45.00	15.65	49.70	21.40	8.02	28.75	8.70	5.83	21.40	16.21	16.21	8.70	5.83	21.40	16.21	16.21	1.43	
<i>Chemical Composition.</i>																									
Moisture	3.400	3.800	2.900	3.000	0.700	1.400	1.800	2.600	2.600	2.400	5.800	3.800	2.200	2.000	1.800	1.800	2.200	2.200	2.000	1.800	2.200	2.200	2.400	2.900	
Combined water and oxide of iron	11.200	11.200	13.200	12.200	6.300	10.600	9.800	10.800	10.800	12.000	6.000	12.200	7.600	11.600	13.800	13.800	6.200	6.200	11.600	13.800	13.800	6.200	6.200	7.400	
Organic	0.050	0.050	0.200	0.040	0.240	0.400	0.520	0.900	0.900	5.000	6.080	6.120	3.760	6.880	9.760	7.360	6.880	6.880	9.760	9.760	7.360	6.880	6.880	8.320	
Line	0.390	0.420	0.220	0.140	0.240	0.400	0.520	0.900	0.900	5.000	6.080	6.120	3.760	6.880	9.760	7.360	6.880	6.880	9.760	9.760	7.360	6.880	6.880	8.320	
Magnesia	0.250	0.216	0.170	0.133	0.093	0.108	0.185	0.085	0.072	0.101	0.173	0.086	0.101	0.086	0.086	0.130	0.374	0.374	0.086	0.130	0.374	0.374	0.374	0.448	
Potash	0.247	0.255	0.170	0.133	0.093	0.108	0.185	0.085	0.072	0.101	0.173	0.086	0.101	0.086	0.086	0.130	0.374	0.374	0.086	0.130	0.374	0.374	0.374	0.448	
Soda	0.365	0.316	0.175	0.453	0.325	0.208	0.184	0.141	0.133	0.291	0.169	0.159	0.169	0.133	0.240	0.263	0.435	0.263	0.435	0.263	0.435	0.263	0.263	0.789	
Sulphuric acid	0.120	0.096	0.065	0.082	0.055	0.055	0.055	0.055	0.066	0.036	0.041	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	
Phosphoric acid	0.125	0.179	0.102	0.064	0.051	0.056	0.102	0.154	0.102	0.080	0.083	0.083	0.083	0.102	0.128	0.051	0.077	0.077	0.102	0.128	0.051	0.077	0.077	0.077	
Containing nitrogen	0.025	0.051	0.011	0.017	0.014	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	
Equal to ammonia	63.900	60.000	53.550	57.170	40.490	66.460	62.860	53.260	66.660	64.260	52.000	44.750	52.000	52.000	57.600	57.600	47.630	47.630	52.000	57.600	57.600	47.630	47.630	52.000	
Reaction P. H.	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	
Chemical analysis	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	

Table I.

SOUTHERN PROVINCE.							
<i>Narandeniya.</i>							
1. Berallyakele ..	7	16	37	36	39	33	0.162
2. Do. ..	7	15	32	40	36	28	0.140
3. Milendolakanda ..	9	36	38	12	31	37	0.157
4. Do. ..	9	15	40	31	38	34	0.174
5. Polhunwa ..	4	9	52	34	6	39	0.106
6. Do. ..	6	17	35	36	31	31	0.134
<i>Galle.</i>							
7. Kotowa ..	7	18	42	29	21	42	0.090
8. Enslawatta ..	15	15	37	27	16	45	0.067
9. Kannaliya ..	3	12	54	28	60	32	0.207
<i>Matara.</i>							
10. Berallya ..	15	16	43	20	22	50	0.095
11. Masmulla ..	12	29	37	15	53	53	0.078
12. Kekandura ..	6	12	57	20	29	32	0.123
<i>Morawaka.</i>							
13. Nathawilahena ..	16	23	27	30	9	51	0.067
14. Mulatiyanakele ..	7	19	31	40	6	42	0.112
15. Keithagamaelahena ..	8	24	37	25	32	37	0.162
<i>Hambantota.</i>							
16. Mahapitakanda ..	9	18	53	15	16	34	0.112
17. Kattakaduwa ..	18	20	47	8	1	46	0.162
18. Botana ..	11	25	57	Nil	Nil	52	0.134
Average ..	9	19	42	25	21	40	0.127
SOUTHERN PROVINCE.							
<i>Narandeniya.</i>							
1. Berallyakele ..	0.380	0.259	0.247	0.015	0.123	0.0038	7.0
2. Do. ..	0.420	0.245	0.255	0.028	0.179	0.0051	6.8
3. Milendolakanda ..	0.220	0.216	0.170	0.0097	0.102	0.0045	6.3
4. Do. ..	0.140	0.360	0.193	0.0100	0.064	0.0064	5.5
5. Polhunwa ..	0.240	0.115	0.093	0.0039	0.051	0.0051	6.3
6. Do. ..	0.120	0.130	0.108	0.0042	0.056	0.0064	5.2
<i>Galle.</i>							
7. Kotowa ..	0.100	0.058	0.185	0.0077	0.102	0.0038	5.3
8. Enslawatta ..	0.100	0.072	0.085	0.0170	0.154	0.0026	6.4
9. Kannaliya ..	0.160	0.101	0.124	0.0130	0.102	0.0032	6.9
<i>Matara.</i>							
10. Berallya ..	0.220	0.173	0.108	0.0135	0.090	0.0038	6.8
11. Masmulla ..	0.180	0.086	0.077	0.0085	0.083	0.0026	7.0
12. Kekandura ..	0.200	0.101	0.077	0.0085	0.102	0.0051	6.9
<i>Morawaka.</i>							
13. Nathawilahena ..	0.220	0.086	0.116	0.0030	0.123	0.0026	7.2
14. Mulatiyanakele ..	0.100	0.086	0.093	0.0090	0.051	0.0026	5.4
15. Keithagamaelahena ..	0.120	0.030	0.116	0.0100	0.077	0.0026	6.1
<i>Hambantota.</i>							
16. Mahapitakanda ..	0.280	0.374	0.417	0.0230	0.077	0.0026	7.0
17. Kattakaduwa ..	0.340	0.173	0.085	0.0140	0.051	0.0040	7.3
18. Botana ..	0.660	0.648	0.425	0.0240	0.179	0.0050	7.2
Average ..	0.161	0.190	0.165	0.0122	0.099	0.0004	6.4

Table A.

SOUTHERN PROVINCE.				Growth.	
<i>Narandeniya.</i>	Rainfall. Inches.	Elevation. Feet.			
1. Berallyakele	100.2*	—	..	Kekuna, Milla, Godapara, Kripedda, &c.	Inside
2. Do.	100.2	—	..	—	Outside
3. Milendolakanda	107.4*	—	..	Del, Bedi-del, Kina, &c.	Inside
4. Do.	107.4	—	..	—	Outside
5. Polhunuwa	78.12*	—	..	Wellpenna, Godapara, Kekuna, &c.	Inside
6. Do.	78.12	—	..	—	Outside
<i>Galle.</i>					
7. Kotowa	123.50	—	..	Del, Pepallya, Dun, Milla, &c.	Inside
8. Enslawatta	130.08	—	..	Pepallya, Diyapara, Godapara, Badulla, Iriya, and Malaboda	Inside
9. Kannaliya	196.48	—	..	Diyapara, Hedawaka, &c.	Inside
<i>Matara.</i>					
10. Berallya	89.78	200*	..	Hora, Godapara, Tawenna, Milla, Goraka, &c.	Inside
11. Masumilla	89.78	200*	..	Kekilla, Bedi-del, Veralu, Hora, Mara, &c.	Inside
12. Kekandura	59.61	157	..	Hora, Bedi-del, Milla, Dan, Kina, Veralu, Kekuna, &c.	Inside
<i>Morawaka.</i>					
13. Nathawillabena	106.46	1,480	..	Kina, Godapara, Kampotta, Kadju, Wira, &c.	Inside
14. Mulatiyanakele	106.46	1,480	..	Godapara, Kampotta, Milla, Diyapara, &c.	Inside
15. Kalthagamalahena	106.46	1,480	..	Kina, Kampotta, Wellpenna, Ankenda, &c.	Inside
<i>Hambantota.</i>					
16. Mahapitakanda	50.0	150	..	Na, Beddel, Sathu, Godapara, Milla, Hora, Ebony, Etamba	Inside
17. Kattakaduwa	38.0	25	..	Palu, Wira, Divul, Kon, Kohomba, Silyambala, Waljambu	Inside
18. Bolana	38.0	25	..	Haimilla, Hilamba, Palu, Kon, Shela, Kumbuk	Inside

\* Average.

## SOUTHERN PROVINCE.

(Table I.)

The Southern Province runs along the southern coast of the Island, and extends backwards from the sea board in a northerly direction towards the centre of the Island with rise of elevation and increase of rainfall. At the places of sampling elevation varies from practically sea level to 1,480 feet in the Morawak district, which is the hilly and northern district of the Province. Rainfall varies from 38-75 inches in Hambantota—the eastern district of the Province—to 106 inches in Morawak.

The varieties of forest growth are determined more by the rainfall than anything else.

Eighteen samples of soil were examined, from Narandeniya (6), Galle (3), Matara (3), Morawak (3), and Hambantota (3) Districts. The soils are of the gravel type so common to the Island. The average coarse gravel amounts to 21 per cent., and varies from 50 per cent. at Kannaliya (9), Galle; 38 per cent., 39 per cent., 36 per cent. at Milendolakanda (4), Berallyakele (1 and 2), 31 per cent. Milendolakanda (3), Polhunuwa (6), Narandeniya; 29 per cent. Kekandura (12), Matara, nil to 1 per cent. at Bolana (18), Kattakaduwa (17), Hambantota;

6 per cent. Polhunuwa (5), Narandeniya ; 6 per cent. Mulatiyanakele (14), Morawaka ; 8 per cent. Masmulla (11), Matara ; 9 per cent. Nathawilahena (13), Morawak ; the others vary from 16 to 22 per cent. coarse gravel. The district with most gravel is Narandeniya 30 per cent., then Galle 29 per cent., followed by Matara 19 per cent., and Morawak 12 per cent. Hambantota, 5 per cent., is the district with least coarse gravel. There is less coarse gravel as the hills are approached and as the rainfall gets less in the district. "Coarse" includes fine gravel, coarse and fine sand, averages 67 per cent. for the Province, and ranges from 85 per cent. at Polhunuwa (5), Narandeniya ; 81 per cent. Kannaliya (9), Galle ; 76 per cent. Kekandura (12), Matara ; 73 per cent., 73 per cent., 72 per cent. at Beraliyakele (1), Polhunuwa (6), Beraliyakele (2), Narandeniya ; 71 per cent. Kotawa (7), Galle ; Malutiyanakele (14), Morawak ; 70 per cent. Milendolakanda (4), Narandeniya ; 69 per cent. Mahapitakanda (16), Hambantota, to 50 per cent. at Milendolakanda (3), Narandeniya ; 52 per cent. at Masmulla (11), Matara ; 55 per cent. at Kattakaduwa (17), 57 per cent. Bolana (18), Hambantota ; Nathawilahena (13), Morawak ; the others vary from 62 to 64 per cent. Hambantota District has the lowest average in the Province with 60 per cent. coarse, Matara and Morawak next with 67 per cent., Galle highest with 72 per cent., Narandeniya next with 70 per cent.

Fine gravel averages 25 per cent., and varies from nil (18), 8 per cent. (17), 12 per cent. (3), 15 per cent. (11, 16), to 40 per cent. (2, 14), 38 per cent. (6), 36 per cent. (1). The sands average 42 per cent., and varies from 57 per cent. (12, 17), 54 per cent. (9), 53 per cent. (16), to 27 per cent. (13), 31 per cent. (14), 32 per cent. (2). "Silts" include silt and fine silt, and averages 19 per cent. for the Province, and varies from 36 per cent. at Milendolakanda (3), Narandeniya ; 29 per cent. Masmulla (11), Matara ; 25 per cent. Bolana (18), Hambantota ; 24 to 23 per cent. Keithagamaelaha (15), Nathawilahena (13), Morawak, to 9 per cent. at Polhunuwa (5), Narandeniya ; 12 per cent. Kannaliya (9), Galle ; Kekandura (12), Matara ; 15 per cent. Beraliyakele (1), Milendolakanda (4), Narandeniya ; Enslawatta (8), Galle ; the others vary from 15 per cent. to 20 per cent.

Morawak district has the highest percentage of silt 22 per cent., followed by Hambantota 21 per cent., Matara 19 per cent., Narandeniya 18 per cent., Galle 15 per cent. Clay average 9 per cent. for the Province, and ranges from 18 per cent. at Kattakaduwa (17), Hambantota ; 16 per cent. Nathawilahena (13), Morawak ; 15 per cent. Enslawatta (8), Galle ; Beraliya (10), Matara, to 8 per cent. at Kannaliya (9), Galle ; 4 per cent. Polhunuwa (5), Narandeniya ; 6 per cent. Polhunuwa (6), Narandeniya, Kekandura (12), Matara ; the



others vary from 12 to 7 per cent. Hambantota has the highest clay 13 per cent., next Matara 11 per cent., Morawak 10 per cent., Galle 8 per cent., Narandeniya 7 per cent. Hambantota District has the least coarse soil and most fine soil in the Province, Morawak, then Matara follow, Narandeniya, and then Galle, the last two are much coarser than the others. Water absorption averages 40 per cent., and ranges from 53 per cent. at Masmulla (11), Matara ; 52 per cent. Bolana (18), Hambantota ; 51 per cent. Nathawilahena (13), Morawak ; 50 per cent. Beraliya (10), Matara, to 28 per cent. at Beraliyakele (2), 31 per cent. Polhunuwa (6), Narandeniya ; 32 per cent. Kannaliya (9), Galle ; Kekanadura (12), Matara ; the others vary from 33 to 48 per cent. Hambantota, Morawak, and Matara Districts average the same water absorption figure 44 to 45 per cent. ; Narandeniya 34 per cent., Galle 40 per cent., are much less ; this is to be expected from the high proportion of coarse particles and the low proportion of fine particles.

Nitrogen is low, averages 0·127 per cent. for the Province, and ranges from 0·207 per cent. at Kannaliya (9), 0·174 per cent. Milendolakanda (4), Galle ; 0·162 per cent. Beraliyakele (1), Narandeniya ; Keithagamaelahena (15), Morawak ; Kattakaduwa (17), Hambantota, to 0·067 per cent. at Enslawatta (8), Galle, Nathawilahena (13), Morawak ; 0·078 per cent. Masmulla (11), Matara ; 0·090 per cent. Kotowa (7), Galle. Narandeniya district has the highest average nitrogen 0·146 per cent., Hambantota is next with 0·136 per cent., then Galle, with 0·121 per cent., Morawak 0·114, Matara 0·099 per cent.

Lime averages 0·161 per cent. for the Province, and ranges from 0·660 per cent. at Bolana (18), Hambantota ; 0·420 to 0·380 per cent. Beraliyakele (2, 1), Narandeniya ; 0·340 per cent. Kattakaduwa (17), Hambantota, to 0·100 per cent., Kotowa and Enslawatta (7-8), Galle ; 0·120 per cent. Polhunuwa (6), 0·140 per cent. Milendolakanda (4), Narandeniya ; 0·160 per cent. Kannaliya (9), Galle ; Mulatiyanakele (14), Morawak ; the others vary from 0·180 to 0·240 per cent. Hambantota District averages 0·427 per cent. for lime, the richest in the Province, next comes Narandeniya district with 0·253 per cent. of lime, then Matara 0·200 per cent., Morawak 0·167 per cent., last Galle 0·120 per cent. As the rainfall decreases the lime increases.

Magnesia averages 0·190 per cent. for the Province, and ranges from 0·648 per cent. at Bolana (18), 0·174 per cent. Mahapitakanda (16), Hambantota ; 0·360 per cent. Milendolakanda (4), 0·259 per cent. Beraliyakele (1), Narandeniya, to 0·058 per cent. Kotowa (7), 0·072 per cent. Enslawatta (8), Galle ; 0·086 per cent. Masmulla (11), Matara ; Nathawilahena (13), Mulatiyanakele (4), Morawak ; the others vary from 0·101 to 0·245 per cent. Hambantota District is richer in magnesia, 0·398 per cent., than the other districts.

Narandeniya is next 0.221 per cent., then Matara 0.120 per cent., Morawak 0.101 per cent., and last Galle 0.077 per cent., magnesia follows the same sequence as the lime.

Potash averages 0.165 per cent. for the Province, and ranges from 0.425 per cent. at Bolana (18), 0.417 per cent. Mahapitakande (16), Hambantota ; 0.255 per cent. to 0.247 per cent. Beraliyakele (2-1), Narandeniya, to 0.077 per cent. Masmulla, Kekandura (11 and 12), Matara ; 0.085 per cent. Enslawatta (8), Galle ; Katakaduwa (17), Hambantota, 0.093 per cent., Polhunuwa (5), Narandeniya, Mulatiyanakele (14), Morawak ; the others range from 0.108 to 0.193 per cent., Hambantota has the highest average for potash, 0.309 per cent., in the Province, Narandeniya follows next 0.178 per cent., Galle 0.131 per cent., Morawak 0.108 per cent., Matara 0.087 per cent.

Available potash (soluble in 1 per cent. citric acid seven days) averages 0.0122 per cent. for the Province, and ranges from 0.026 per cent. at Beraliyakele (2), Narandeniya ; 0.024 per cent. Bolana, 0.023 per cent. Mahapitakanda (16), Hambantota, to 0.0030 per cent., Nathawilahena (13), Morawak ; 0.0039 to 0.0042 per cent., Polhunuwa (5-6), Narandeniya ; the others vary from 0.017 to 0.0077 per cent.

Phosphoric acid averages 0.099 per cent. and varies from 0.179 per cent. in Beraliyakele (2), Narandeniya ; Bolana (18), Hambantota ; 0.154 per cent., Enslawatta (8), Galle ; 0.128 per cent. Beraliyakele (1), Narandeniya ; Nathawilahena (18), Hambantota, to 0.051 per cent. at Polhunuwa (5), Narandeniya ; Mulatiyanakele (14), Morawak ; Kattakaduwa (17), Hambantota ; 0.056 per cent. Polhunuwa (6), 0.064 per cent. Milendolakanda (4), Narandeniya ; the others vary from 0.077 to 0.102 per cent. Available phosphoric acid averages 0.005 per cent., and varies from 0.0064 per cent. Milendolakanda (4), Polhunuwa (5), Narandeniya, 0.0051 per cent. Beraliyakele (2), Polhunuwa (5), Narandeniya, Kekandura (12), Matara, to 0.0026 per cent. Enslawatta (8), Galle, Masmulla (11). Matara ; Nathawilahena (13), Keithagamaelahena (15), Morawak ; Mahapitakanda (16), Hambantota ; the others vary from 0.0032 to 0.0050 per cent. The phosphoric acid generally is poor.

The reaction for acidity (P. H.) indicates that, generally speaking, the Province is acid. Of the Narandeniya district Beraliyakele (1 and 2) are the only two soils of the district which are neutral or nearly so, the others are all acid, especially Nos. 3, 4, and 6, Milendolakanda, Polhunuwa. In the Galle District Kannaliya (9) is the only nearly neutral soil, the other two are acid. Kotowa (7) more so than the others. Matara District is practically neutral. Morawak is acid in 14 and 15, more so in 14. No. 13 is nearly neutral. Hambantota District is on the alkaline side of neutral.

# Province of Sabaragamuwa.

	Pelmadulla Range.			Rampura Range.			Kegalla Range.									
	Paragalkonda P. E.			Paragalkonda P. E.			Paragalkonda P. E.			Paragalkonda P. E.			Paragalkonda P. E.			
	Inside.	Outside.		Inside.	Outside.		Inside.	Outside.		Inside.	Outside.		Inside.	Outside.		
<i>Mechanical Composition.</i>																
Hygroscopic moisture and salts dissolved	4.20	1.70		1.50	2.50		3.50	2.40		2.30	2.60		4.00	2.90		2.50
Humus	1.40	3.40		2.70	1.70		1.70	10.30		8.50	13.40		22.80	10.90		8.50
Clay silt	0.30	8.80		9.60	13.40		18.00	10.00		12.10	17.20		18.50	11.40		12.10
Silt	7.00	4.80		10.30	16.70		10.00	5.00		9.50	6.70		8.40	8.50		8.40
Fine sand	18.50	6.90		15.60	14.80		18.20	10.50		11.40	19.50		18.50	22.40		18.50
Coarse sand	32.50	44.60		27.10	28.10		27.20	12.20		43.10	29.80		22.70	27.60		42.10
Coarse gravel	40.50	24.80		19.00	5.00		16.22	Nil		9.08	9.00		6.45	8.15		7.15
Water absorption	30.0	32.0		32.0	46.00		35.00	50.00		39.00	42.00		48.00	38.00		48.00
<i>Chemical Composition.</i>																
Organic matter and combined	4.600	2.400		2.400	2.800		3.800	1.900		2.800	2.600		2.800	2.000		1.800
Water	15.200	14.200		16.800	12.000		16.600	9.900		11.800	14.200		14.200	11.900		12.400
Oxide of iron and manganese	18.720	19.085		20.988	16.564		22.061	14.828		21.556	17.838		10.308	27.978		18.450
Oxide of alumina	0.280	0.140		0.180	0.200		0.180	0.220		0.220	0.220		0.120	0.240		0.220
Magnesia	0.202	0.130		0.144	0.144		0.293	0.158		0.187	0.101		0.245	0.274		0.302
Soda	0.695	0.232		0.276	0.283		0.309	0.083		0.159	0.203		0.203	0.247		0.247
Sulphuric anhydride	0.082	0.096		0.065	0.069		0.082	0.055		0.069	0.088		0.055	0.055		0.089
Phosphoric acid	0.384	0.102		0.102	0.077		0.128	0.102		0.128	0.077		0.077	0.051		0.051
Chlorine	0.074	0.025		0.023	0.028		0.030	0.020		0.107	0.118		0.077	0.015		0.015
Sand and silicates	51.460	53.267		45.203	46.208		46.208	60.120		50.146	48.118		48.118	48.118		59.649
Equal to ammonia	0.306	0.252		0.245	0.245		0.274	0.150		0.177	0.280		0.151	0.307		0.207
Lower oxide of iron	0.006	0.006		0.006	0.006		0.006	0.006		0.006	0.006		0.006	0.006		0.006
Hydrogen F. H.	0.018	0.018		0.018	0.018		0.018	0.018		0.018	0.018		0.018	0.018		0.018
Chloride soluble potash	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000
Silicic soluble phosphate acid	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000

Table II.

		Clay.	Silt.	Sand.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen
PROVINCE OF SABARAGAMUWA.								
<i>Palmedulla.</i>								
1. Muwagankanda	..	11	16	27	38	44	—	0.252
2. Do.	..	11	13	26	44	25	30	0.207
<i>Rainapura.</i>								
3. Paragaltenne	..	6	20	43	27	19	32	0.202
<i>Kegalla.</i>								
4. Paradeniya	..	12	20	24	23	5	46	0.202
5. Nayahena..	..	6	26	34	27	16	35	0.224
6. Pindenlya	..	10	15	57	12	NH	50	0.129
7. Kiriwandeniya	..	8	22	23	42	9	39	0.146
8. Paspalakanda	..	13	24	27	30	9	42	0.230
9. Wasolla	..	23	27	20	23	8	48	0.151
10. Bambaragalla	..	11	20	36	27	8	33	0.302
11. Mahahentenna	..	8	21	25	42	7	43	0.207
Average..	..	11	20	31	• 31	13	37	0.209
		Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction.
PROVINCE OF SABARAGAMUWA.								
<i>Palmedulla.</i>								
1. Muwagankanda	..	0.280	0.202	0.695	0.018	0.384	0.0006	6.9
2. Do.	..	0.140	0.130	0.232	0.014	0.102	0.005	7.4
<i>Rainapura.</i>								
3. Paragaltenne	..	0.180	0.144	0.170	0.007	0.102	0.0038	7.1
<i>Kegalla.</i>								
4. Paradeniya	..	0.200	0.144	0.293	0.018	0.077	0.006	5.7
5. Nayahena	..	0.180	0.893	0.517	0.027	0.128	0.010	6.2
6. Pindenlya	..	0.220	0.158	0.154	0.019	0.102	0.0028	6.8
7. Kiriwandeniya	..	0.220	0.187	0.463	0.033	0.128	0.0028	6.9
8. Paspalakanda	..	0.220	0.101	0.139	0.018	0.256	0.0026	7.1
9. Wasolla	..	0.120	0.245	0.293	0.015	0.077	0.0028	7.5
10. Bambaragalla	..	0.340	0.274	0.065	0.023	0.051	0.0038	6.7
11. Mahahentenna	..	0.220	0.302	0.386	0.022	0.051	0.0026	7.4
Average ..	..	0.211	0.262	0.311	0.019	0.132	0.0038	—

Table B.

PROVINCE OF  
SABARAGAMUWA.

	Rainfall. Inches.	Elevation. Feet.	Growth.	
<i>Pelmadulla.</i>				
1. Muwagankanda ..	132.29 ..	200 ..	Etamba, Badulla, Malaboda, Hora, Tinniya, &c.	Inside
2. Do, ..	132.29 ..	200 ..	—	Outside
<i>Ratnapura.</i>				
3. Paragaltenne ..	150.81 ..	300 ..	Aridda, Malaboda, Kekuna, Iriya, &c.	Inside
<i>Kegalla.</i>				
4. Paradeniya ..	150 to 200	75 ..	Nedun, Liyan, Milla, Hedawa- waka, Naimbul, Lunumidella, Del	Inside
5. Nayahena ..	do. ..	30 ..	Kos, Del, Suriamara, Milla, Naimbul, Rakkaltenne, Kos	Inside
6. Pindeniya ..	do. ..	100 ..	Hora, Pitan, Milla, Hedawaka, Iriya, Malaboda, &c.	Inside
7. Kiriwandeniya ..	do. ..	310 ..	Milla, Del, Kos, Mora, Goraka, Laulu, Haimilla, Kekuna ..	Inside
8. Paspolakanda ..	do. ..	260 ..	Milla, Del, Kos, Mora, Damba, Ketakele, Liyan, Bakmi, Iriya, Malaboda, Kekuna, Iriya	Inside
9. Wagolla ..	do. ..	320 ..	Kos, Del, Milla, Lunumidella, Pitan, Malaboda, Iriya ..	Inside
10. Bambaragalla ..	do. ..	550 ..	Del, Milla, Damba, Goraka, Netau, Malaboda, Katukenda ..	Inside
11. Mahabentenna ..	do. ..	310 ..	Lunumidella, Maru, Malaboda, Iriya, Goraka, Katukenda, Kina, Kekuna, Milla, Kos, Nedun, &c.	Inside

## PROVINCE OF SABARAGAMUWA.

The Province of Sabaragamuwa is an inland Province lying between the hill belt and the Southern Province. At places of sampling the elevation varied from 30 feet to 550 feet, and rainfall from 150 inches to 200 inches.

Eleven samples were examined.

The Sabaragamuwa soils are of the gravel type, but not quite so coarse as those of the Southern Province. The average coarse gravel for the Province is 13 per cent., and varies from 44 per cent. to 25 per cent. Muwagankanda (1 and 2), Pelmadulla; 19 per cent. Paragaltenne, Ratnapura; 16 per cent. Nayahena (5), Kegalla, to nil at Pindeniya (6), 5 per cent. Paradeniya (4), Kegalla; the others vary from 6 to 9 per cent. "Coarse" (fine gravel and sands) averages 66 per cent. for the Province, and varies from 71 per cent. at Muwagankanda, Pelmadulla, 70 per cent. Paragaltenne (3), Ratnapura, 69 per cent. Pindeniya (6), Kegalla, to 43 per cent. at Wagolla (9), 57 per cent. Paspolakanda (8), Kegalla; the

others vary from 61 to 67 per cent. Fine gravel averages 31 per cent. and varies 12 per cent. (6), 23 per cent. (9) to 44 per cent. (2), 42 per cent. (7, 11). Sands vary from 57 per cent. (6), 43 per cent. (3), average 31 per cent. Silts average 20 per cent. for the Province, and varies from 27 per cent. at Wagolla (9), 26 per cent. Nayahena (5), Kegalla, to 13 to 16 per cent. at Muwagankanda (2 and 1), Pelmadulla; 15 per cent., Pindeniya, (6), Kegalla; the others vary from 20 to 24 per cent. Clay averages 11 per cent. for the Province, and varies from 23 per cent. Wagolla (9), Kegalla, to 6 per cent. Paragaltenna (3), Ratnapura; Nayahena (5), Kegalla; the others vary from 8 to 13 per cent. Water absorption averages 37 per cent. for the Province, and varies from 30 to 32 per cent. at Muwagankanda (2), Pelmadulla; Paragaltenna (3), Ratnapura, 35 per cent. Nayahena (5), Kegalla, to 50 per cent. Pindeniya (6), 48 per cent. Wagolla (9), Kegalla; the others vary from 38 to 43 per cent.

Nitrogen averages 0·209 per cent. for the Province, and ranges from 0·302 per cent. at Bambaragalla (10), 0·280 per cent. Paspalakanda (8), Kegalla, to 0·129 per cent. Pindeniya (6), 0·146 per cent. Kiriwandeniya (7), 0·151 per cent. Wagolla (9), Kegalla; the others vary from 0·202 to 0·252 per cent.

Lime averages 0·211 per cent. for the Province and ranges from 0·120 per cent. at Wagolla (9), Kegalla; 0·140 per cent. Muwagankanda (2), Pelmadulla, to 0·340 per cent. at Bambaragalla (10), Kegalla; 0·280 per cent. Muwagankanda (1), Pelmadulla; the others range from 0·180 to 0·220 per cent.

Magnesia averages 0·252 per cent. for the Province, and ranges from 0·893 per cent. Nayahena (5), 0·302 per cent. Mahahentenna (11), Kegalla, to 0·101 per cent., Paspalakanda (8), 0·130 per cent., Muwagankanda (2), Pelmadulla; the others vary from 0·144 per cent. to 0·274 per cent.

Potash averages 0·311 per cent. for the Province, and ranges from 0·695 per cent. at Muwagankanda (1), Pelmadulla; 0·517 per cent. Nayahena (5), 0·463 per cent. Kiriwandeniya (7), 0·386 per cent. Mahahentenna (11), Kegalla, to 0·085 per cent. at Bambaragalla, 0·139 per cent. Paspalakanda (8), 0·154 per cent. Pindeniya (6), Kegalla; the others vary from 0·170 to 0·293 per cent. Available potash averages 0·019 per cent. for the Province, and ranges from 0·007 per cent. at Paragaltenna (3), Ratnapura; 0·013 per cent. Paradeniya (4), 0·014 per cent. Muwagankanda (2), Pelmadulla, to 0·033 per cent. at Kiriwandeniya (7), 0·027 per cent. Nayahena (5), Kegalla; the others range from 0·015 per cent. to 0·023 per cent.

Phosphoric acid averages 0.132 per cent. for the Province, and ranges from 0.384 per cent. at Muwagankanda (1), Pelmadulla, 0.256 per cent. Paspalakanda (8), Kegalla, to 0.061 per cent. at Bambaragalla (10), Mahahentenna (11), Kegalla; the others vary from 0.077 to 0.128 per cent. Available phosphoric acid averages 0.0038 per cent. for the Province, and ranges from 0.006 per cent. Muwagankanda (1), Pelmadulla, to 0.010 per cent. at Nayahena (5), Kegalla; the others range from 0.0026 to 0.006 per cent.

The reaction is practically neutral in Muwagankanda (1), Pelmadulla; Paragaltenna (3), Pelmadulla; Kiriwadeniya (7), Paspalakanda (8), Kegalla; those showing an alkaline reaction are Muwagankanda (2), Pelmadulla; Wagolla (9), Mahahentenna (11), Kegalla. Acid soils are Paradeniya (4), Nayahena (5), Pindeniya (6), Bambaragalla (6), Kegalla; the most acid is 4; the most alkaline soils 9, 11, 6.

### Central Province.

	Kandy.		Nuwara Eliya.	
	Udawattekele Reserve.		Kandapola Reserve.	
	Inside.	Outside.	Inside.	Outside.
	1	2	3	4
<i>Mechanical Composition.</i>				
Hygroscopic moisture and salts dissolved .. ..	2.20	2.60	7.20	13.50
Humus .. ..	2.30	2.40	7.40	13.30
Clay .. ..	5.40	11.50	14.50	11.10
Fine silt .. ..	14.40	5.40	13.30	20.60
Silt .. ..	6.50	5.30	7.50	14.50
Fine sand .. ..	13.70	13.00	10.10	15.10
Coarse sand .. ..	25.00	22.70	11.60	8.30
Fine gravel .. ..	30.50	37.10	28.50	3.70
Coarse gravel .. ..	6.00	3.10	5.30	Nil
Water absorption .. ..	44.00	46.00	45.00	66.00

### Chemical Composition.

Moisture .. ..	3.900	3.800	5.600	8.200
Organic matter and combined water .. ..	9.100	9.400	21.400	28.100
Oxide of iron and manganese .. ..	8.800	11.160	8.640	8.640
Oxide of alumina .. ..	14.986	17.400	21.587	16.162
Lime .. ..	0.380	0.620	0.220	0.200
Magnesia .. ..	0.547	0.979	0.249	0.144
Potash .. ..	0.738	0.728	0.263	0.247
Soda .. ..	0.642	0.642	0.437	0.258
Sulphuric anhydride .. ..	0.042	0.110	0.123	0.153
Phosphoric acid .. ..	0.089	0.102	0.102	0.090
Chlorine .. ..	0.021	0.021	0.039	0.046
Sand and silicates .. ..	59.816	55.640	41.340	37.640
Containing nitrogen .. ..	0.140	0.168	0.431	0.580
Equal to ammonia .. ..	0.170	0.204	0.524	0.680
Lower oxide of iron .. ..	Good	Fair	Fair	Fair
Reaction P. H. .. ..	6.7	7.8	6.4	6.3
Humus .. ..	Fair	Fair	Very Good	Reserve
Citric soluble potash .. ..	0.019	0.012	0.014	0.015
Citric soluble phosphoric acid .. ..	0.006	0.006	0.010	0.011

Table III.

CENTRAL PROVINCE.		Clay.	Silt.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
<i>Kandy.</i>								
1. Udawattekele	..	5	21	33	31	6	44	0.140
2. Do.	..	12	11	36	37	3	46	0.168
<i>Nuwara Eliya.</i>								
3. Kandapola	..	14	21	22	29	5	45	0.431
4. Do.	..	11	35	24	4	Nil	66	0.560
Average..	..	10	22	30	25	3	50	0.325

  

CENTRAL PROVINCE.		Line.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction P. H.
<i>Kandy.</i>								
1. Udawattekele	..	0.380	0.547	0.733	0.019	0.089	0.006	6.7
2. Do.	..	0.620	0.979	0.726	0.012	0.102	0.006	7.3
<i>Nuwara Eliya.</i>								
3. Kandapola	..	0.220	0.249	0.263	0.014	0.102	0.010	6.4
4. Do.	..	0.200	0.144	0.247	0.015	0.090	0.011	6.8
Average..	..	0.355	0.480	0.492	0.016	0.098	0.008	6.8

Table C.

CENTRAL PROVINCE.		Rainfall.	Elevation.	Growth.
<i>Kandy.</i>		Inches.	Feet.	
1. Udawattekele	.. 83.40 ..	1,750 ..	Bedidel, Kos, Milla, Pehembiya, Veralu, Kuda Dawula, Mora, Sapu	Inside
2. Do.	.. 83.40 ..	1,750 ..	Grass and weeds	Outside
<i>Nuwara Eliya.</i>				
3. Kandapola	.. 96.68 ..	6,200 ..	Domba, Pehembiya, Kina	Inside
4. Do.	.. 96.68 ..	6,200 ..	Patana land	Outside

## CENTRAL PROVINCE.

(Table III.)

The Central Province lies north of the Province of Sabaragamuwa, and occupies the central or middle portion of the Island. Elevation rises to over 6,000 feet at places of sampling. Rainfall 83-97 inches. Climate is cool, at the higher elevation frosts sometimes occur. Four samples were examined from this Province.

Coarse gravel averages 3 per cent. for the Province, and ranges from nil at Kandapola (4), Nuwara Eliya, to 5 per cent. at Kandapola (3), Nuwara Eliya; 6 per cent. Udawattekele



(1), Kandy. "Coarse" averages 55 per cent. for the Province, and ranges from 73 to 69 per cent. at Udawattekele (2 and 1), Kandy, to 50 per cent. at Kandapola (3), Nuwara Eliya; 27 per cent. at No. 4. Silts average 22 per cent. for the Province, and vary from 35 per cent. at Kandapola (4), Nuwara Eliya, 21 per cent. at Kandapola (3), Nuwara Eliya, Udawattekele (1), Kandy, 11 per cent. at No. 2. Clay averages 10 per cent. for the Province, and varies from 14 per cent. at Kandapola (3), Nuwara Eliya, 11 per cent. at No. 4, 12 per cent. at Udawattekele (2), Kandy; 5 per cent. at No. 1. Water absorption averages 50 per cent. for the Province, and ranges from 66 per cent. at Kandapola (4), Nuwara Eliya, 44 to 46 per cent. in the others.

Nitrogen averages 0.325 per cent. for the Province, and ranges from 0.560 per cent. at Kandapola (4), Nuwara Eliya, 0.431 per cent. at No. 3 to 0.140 per cent. to 0.168 per cent. at Udawattekele (1 and 2), Kandy. Lime averages 0.355 per cent. and varies from 0.620 per cent. Udawattekele (2), Kandy; 0.380 per cent. No. 1, to 0.200 to 0.220 per cent. Kandapola (4 and 3), Nuwara Eliya. Magnesia averages 0.480 per cent., and varies from 0.979 per cent. Udawattekele (2), 0.547 per cent. No. 1, Kandy, to 0.249 per cent. Kandapola (3), Nuwara Eliya; 0.144 per cent. at No. 4. Potash averages 0.492 per cent., and varies from 0.733 to 0.726 per cent. at Udawattekele (1 and 2), Kandy, to 0.247 to 0.263 per cent., Kandapola (3 and 4), Nuwara Eliya. Available potash averages 0.015 per cent. Phosphoric acid averages 0.098 per cent. Available phosphoric acid averages 0.008 per cent.

The soils are slightly acid, except Udawattekele (2), Kandy. Kandapola (3), Nuwara Eliya, is the most acid.

It is noted at many places, down to about 2,000 feet, that the forest belt is well defined, forest giving way to patanas. As these are virgin areas, natural conditions apparently determine forests or other growths. Atmospheric conditions, such as temperature, rainfall, wind, &c., being the same, the conditions of growth must be searched for in the soils. A comparison of the two Kandapola soils examined throws some light on the subject. The mechanical analyses indicate that where the forest grows is more gravelly than outside the forest growth. Inside the forest, besides 50 per cent. "coarse," there is 5 per cent. coarse gravel, whereas outside the forest area contains 27 per cent. "coarse," and no coarse gravel. There are 32 per cent. silts outside the forest area, against 21 per cent. inside the forest. Clay is higher in the forest area (14.5 per cent.), against 11 per cent. in the patana-grown area, making a total of 43 per cent. "fine" in the patana-grown

area, against 35 per cent. in the forest area. The fineness of the soil particles of the patana-grown area enables the soil mass to hold more water; this is demonstrated by the water holding capacity of the patana-grown area, 66 per cent., against 45 per cent. for the forest area. The larger supply of organic matter in the patana-grown area assists the fine particles of the soil mass in retaining the moisture. The production of organic matter outside the forest is greater than inside the forest. In some of the patana-grown parts it has been noted that acid growth takes place, an extreme case of the conditions indicated, where anaerobic conditions occur, due to accumulation of fine soil particles and organic matter decreasing drainage and aeration and choking the soil mass. The plant food outside the forest is in less supply (in percentage and per acre) than inside the forest area, but it is ample to sustain vigorous forest growth if the conditions were suitable. The limiting factor deciding whether forest or patanas grow is apparently moisture (and drainage). The conditions originally suited the growth of patana better than forest, and being more vigorous held its position, developed toxic bodies inimical to the growth of forest, and stayed the development of the forest as if a line had been drawn across the landscape. Where tea estates have taken the place of forests and patana, the growth—patana or forest—has been burnt down to prepare the land, the heat developed destroyed the toxic bodies, and by drainage and cultivation tea and shade trees thrive well (but the growth on the patana land is never up to the standard of the old forest land), indicating that the forest area would extend naturally if soil conditions suitable to forest growth were present.

The forest or jungle in other areas is confined to ravines, the trees thriving where moisture is sufficient for their needs, the shelter of the ravine benefiting the growth; these ravines are well drained. Where the rock formation is near the surface—slab rock—there is no depth of soil, soil mass is decreased, and there is no forest growth, the patanas thrive as the conditions suit their requirements.

Apparently, the limiting factor in forest growth is moisture, if there is too much moisture retained in the soil mass, due to insufficient drainage, grasses (patanas) get the upper hand and retain their position, if there is too little moisture in the soil mass, grasses (patanas) alone will thrive.

The present line of demarcation of forest and patana is not considered always to be the original line. When the hunting phase of the local inhabitants gave way to the more civilized mode of living, namely, agriculture, pasturage had to be found

for their flocks, and no doubt large areas of forest were cleared for this purpose. As the pasturage grew rank and the agriculturist was of the nomad class, depletion of the forests spread. The forest at higher elevations were spared, as the lower elevations were more amenable to the constitutions and habits of the inhabitants.

**North-  
Central Province.**

		Newaragam Reserve. Inside.	North Bang. Outside.
<i>Mechanical Composition.</i>			
Hygroscopic moisture and salts dissolved	..	8.10	8.30
Humus	..	1.20	0.80
Clay	..	5.50	4.40
Fine silt	..	9.70	11.10
Silt	..	7.40	9.70
Fine sand	..	12.00	28.00
Coarse sand	..	8.30	23.50
Fine gravel	..	52.50	18.60
Coarse gravel	..	12.30	6.70
Water absorption	..	32.00	40.00
<i>Chemical Composition.</i>			
Moisture	..	6.000	3.500
Organic matter and combined water	..	8.200	5.500
Oxide of iron and manganese	..	12.000	6.400
Oxide of alumina	..	16.422	7.891
Lime	..	0.380	0.800
Magnesia	..	0.245	0.230
Potash	..	0.310	0.347
Soda	..	0.609	0.625
Sulphuric anhydride	..	0.100	0.014
Phosphoric acid	..	0.102	0.089
Chlorine	..	0.013	0.014
Sand and silicates	..	55.710	75.190
Containing nitrogen	..	0.101	0.084
Equal to ammonia	..	0.122	0.102
Lower oxide of iron	..	Fair	Fair
Reaction F. H.	..	7.6	7.7
Humus	..	Poor	Poor
Citric soluble potash	..	0.612	0.611
Citric soluble phosphoric acid	..	0.004	0.001

Table IV.

	Clay.	Silt.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
NORTH-CENTRAL PROVINCE.							
1. <i>Nuwaraagama.</i>	5	17	21	53	15	32	0.101
2. <i>Do.</i>	21	52	19	9	40	36	0.084
<i>Average</i>	19	36	36	36	9	36	0.092

  

	Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction.
NORTH-CENTRAL PROVINCE.							
1. <i>Nuwaraagama.</i>	0.380	0.245	0.310	0.012	0.102	0.004	7.6
2. <i>Do.</i>	0.200	0.230	0.347	0.011	0.089	0.003	7.4
<i>Average</i>	0.290	0.237	0.329	0.011	0.096	0.0035	7.5

Table D.

NORTH-CENTRAL PROVINCE.		Rainfall.	Elevation.	Growth.	
		Inches.	Feet.		
1.	Niwaragam Reserve	50.55 ..	50 ..	Palu, Wira, Satin, Ranai ..	Inside
2.	Do.	.. 50.55 ..	50 ..	Grass land	Outside

## NORTH-CENTRAL PROVINCE.

(Table IV.)

The North-Central Province lies north of the Central Province, and at a lower elevation and rainfall. Two samples were examined from this area.

Coarse gravel averages 9 per cent., "coarse" 71 per cent., silts 19 per cent., clay 4 per cent., water absorption 36 per cent.

Nitrogen is poor 0.092 per cent., lime averages 0.290 per cent.; magnesia 0.237 per cent., potash 0.329 per cent.; Available potash 0.011 per cent., Phosphoric acid 0.096 per cent.; Available phosphoric acid 0.0035. The soils are slightly alkaline.

## North-Western Province.

## Kurunegala Range.

Gambiriya-gas-	Dawal-
yayamukalana.	kanda.
Inside.	Outside.

1 2

## Mechanical Composition.

Hygroscopic moisture and salts dissolved	..	5.60 ..	3.60
Humus	..	2.30 ..	3.20
Clay	..	4.50 ..	10.70
Fine silt	..	15.00 ..	14.30
Silt	..	7.20 ..	10.00
Fine sand	..	25.20 ..	15.70
Coarse sand	..	25.30 ..	27.50
Fine gravel	..	14.90 ..	15.00
Coarse gravel	..	1.00 ..	NH
Water absorption	..	42.00 ..	46.00

## Chemical Composition.

Moisture	..	5.000 ..	3.4000
Organic matter and combined water	..	6.600 ..	9.600
Oxide of iron and manganese	..	6.400 ..	6.400
Oxide of alumina	..	8.552 ..	13.469
Lime	..	0.580 ..	0.260
Magnesia	..	0.461 ..	0.230
Potash	..	0.517 ..	0.641
Soda	..	0.948 ..	0.249
Sulphuric anhydride	..	0.096 ..	0.151
Phosphoric acid	..	0.102 ..	0.128
Chlorine	..	0.119 ..	0.021
Sand and silicates	..	70.638 ..	65.451
Containing nitrogen	..	0.084 ..	0.224
Equal to ammonia	..	0.102 ..	0.272
Lower oxide of iron	..	Fair	Good
Reaction P. H.	..	7.7	7.8
Humus	..	Poor	Good
Citric soluble potash	..	0.010 ..	0.025
Citric soluble phosphoric acid	..	0.005 ..	0.004

Table V.

	Clay.	Silts.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
NORTH-WESTERN PROVINCE.							
<i>Kurunegala.</i>							
1. Gambiriya-gasyayamukalana	4	22	50	15	1	42	0.084
2. Dewalkanda ..	11	24	43	15	Nil	46	0.224
Average ..	7	23	47	15	—	44	0.154

  

	Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction P. H.
NORTH-WESTERN PROVINCE.							
<i>Kurunegala.</i>							
1. Gambiriya-gasyayamukalana	0.560	0.461	0.517	0.010	0.102	0.005	7.7
2. Dewalkanda ..	0.260	0.230	0.641	0.025	0.128	0.004	7.3
Average ..	0.410	0.346	0.579	0.017	0.115	0.0045	7.5

Table E.

NORTH-WESTERN PROVINCE.					
<i>Kurunegala.</i>					
	Rainfall. Inches.	Elevation. Feet.	Growth.		
1. Gambiriya-gasyayamukalana ..	52.52 ..	329 ..	Palu, Kumbuk, Satin, Veralu, Dan, &c.		
2. Dewalkanda ..	52.52 ..	180 ..	—		
				Inside	Outside

## NORTH-WESTERN PROVINCE.

(Table V.)

The North-Western Province lies west of the North-Central and Central Provinces, and extends to the sea. Elevation at places of sampling 180 to 329 feet. Rainfall 52 inches. Two samples were examined from the Province.

Coarse gravel varies from nil to 1 per cent. "Coarse" averages 61 per cent. for the samples, and varies from 58 to 65 per cent. Silts averages 23 per cent., clay averages 7 per cent. Water absorption averages 44 per cent. Nitrogen averages 0.154 per cent., and varies from 0.084 per cent. to 0.224 per cent. Lime averages 0.410 per cent., and varies from 0.260 to 0.560 per cent. Magnesia averages 0.346 per cent., and varies from 0.230 per cent. to 0.460 per cent. Potash averages 0.579 per cent., and varies from 0.517 to 0.641 per cent. Available potash averages 0.017 per cent., and varies from 0.010 to 0.025 per cent. Phosphoric acid averages 0.115 per cent., and varies from 0.102 to 0.128 per cent. Available phosphoric acid averages 0.0045 per cent. The soils examined are slightly alkaline.

## Province of Uva.

## Soil Range.

	Paliyagoda. Inside.	Bibbe. Outside.	Galhada. Inside.	Mukalana. Outside.
	1	2	3	4
<i>Mechanical Composition.</i>				
Hygroscopic moisture and salts dissolved	2.50	2.80	2.80	4.20
Humus	1.20	2.80	2.20	2.50
Clay	8.80	13.30	10.90	9.60
Fine silt	12.90	13.20	10.10	8.80
Silt	6.50	6.20	7.50	5.80
Fine sand	27.70	28.20	21.40	19.00
Coarse sand	30.30	28.60	21.40	19.00
Fine gravel	10.10	8.90	23.70	30.40
Coarse gravel	0.50	0.70	13.40	6.30
Water absorption	47.00	53.00	38.00	38.00

*Chemical Composition.*

Moisture	2.400	3.000	3.800	2.000
Organic matter and combined water	5.500	8.800	6.400	8.000
Oxide of iron and manganese	6.080	7.840	8.000	7.380
Oxide of alumina	9.432	10.984	11.621	14.031
Lime	0.180	0.240	0.200	0.280
Magnesia	0.173	0.216	0.115	0.230
Potash	0.388	0.549	0.263	0.164
Soda	0.404	0.573	0.258	0.572
Sulphuric anhydride	0.042	0.042	0.086	0.056
Phosphoric acid	0.089	0.051	0.090	0.179
Chlorine	0.014	0.014	0.017	0.039
Sand and silicates	73.300	68.700	69.140	67.100
Containing nitrogen	0.112	0.134	0.140	0.095
Equal to ammonia	0.136	0.163	0.170	0.116
Lower oxide of iron	Fair	Fair	Nil	Trace
Reaction P. H.	7.2	6.6	7.4	7.1
Humus	Good	Good	Fair	Fair
Citric soluble potash	0.034	0.015	0.016	0.018
Citric soluble phosphoric acid	0.003	0.005	0.005	0.004

Table VI.

PROVINCE OF UVA.		Clay.	Silts.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
<i>Bibile.</i>								
1.	Paliyagoda	9	19	58	10	0.5	47	0.112
2.	Do.	13	18	53	6	0.7	53	0.134
3.	Galhadamukalana	11	18	49	24	13.4	38	0.140
4.	Do.	9	15	39	30	6.0	38	0.095
Average		10	18	48	18	5.0	43	0.120

  

PROVINCE OF UVA.		Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction.
<i>Bibile.</i>								
1.	Paliyagoda	0.180	0.173	0.386	0.034	0.089	0.003	7.2
2.	Do.	0.240	0.216	0.540	0.015	0.051	0.005	6.5
3.	Galhadamukalana	0.200	0.115	0.263	0.018	0.090	0.005	7.4
4.	Do.	0.230	0.230	0.154	0.018	0.179	0.004	7.1
Average		0.225	0.183	0.336	0.021	0.102	0.0042	7.0

Table F.

PROVINCE OF UVA.		Rainfall.	Elevation.	Growth.	
<i>Bibile.</i>		Inches.	Feet.		
1.	Bibile (Paliyagoda)	86.61	680	Satin, Kos, Ketakele, Suriya, Mara	Inside
2.	Do.	86.61	680	Grass land	Outside
3.	Galhadamukalana	86.61	—	Satin, Milla, Kon, Pehembiya, Damba, Kos	Inside
4.	Do.	86.61	—	Grass land	Outside

## PROVINCE OF UVA.

(Table VI.)

The Province of Uva lies east of the Central Province and at lower elevation. Four samples were examined.

Coarse gravel averages 5 per cent. and varies from 0.5 to 0.7 per cent. at Paliyagoda to 6 to 13.4 per cent. at Galhadamukalana. "Coarse" averages 66 per cent., and varies from 62 to 69 per cent. Silts average 18 per cent., and vary from 15 to 19 per cent. Clay averages 10 per cent., and varies from 9 to 13 per cent. Water absorption averages 43 per cent., and varies from 33 per cent. at Galhadamukalana (4) to 53 per cent. at Paliyagoda (2).

Nitrogen averages 0.120 per cent., and varies from 0.095 per cent., Galhadamukalana (4) to 0.134 per cent., Paliyagoda (2), 0.140 per cent. Galhadamukalana (3). Lime averages 0.225 per cent., and varies from 0.180 per cent. to 0.280 per cent. Magnesia averages 0.183 per cent., and varies from 0.115 to 0.230 per cent. Potash averages 0.336 per cent., and varies from 0.154 per cent. at Galhadamukalana to 0.540 per cent. at Paliyagoda. Available potash averages 0.021 per cent., and varies from 0.015 per cent. to 0.034 per cent. Phosphoric acid averages 0.102 per cent., and varies from 0.051 per cent. to 0.179 per cent. Available phosphoric acid averages 0.0042 per cent. The reaction is on the alkaline side, except Paliyagoda (2), which is acid.

**Eastern Province.**

( 21 )

Mechanical Composition, Hygroscopic moisture and volatile constituents	Kankhal F. R.		Pankulam F. R.		Dorlane Range, Nuwaragala P. R.		Akureypan Range, Panama P. R.		Akureypan Range, Tallipodaathu P. R.		Akureypan Range, Maha-oya Vakaneri Forest.		Akureypan Range, Maha-oya Vakaneri Forest.	
	Inside. 1	Outside. 2	Inside. 3	Outside. 4	Inside. 5	Outside. 6	Inside. 7	Outside. 8	Inside. 9	Outside. 10	Inside. 11	Outside. 12		
Clay	3.80	5.00	3.30	3.30	3.00	2.70	1.10	1.50	3.00	4.30	3.00	1.80	0.80	
Humus	13.00	13.00	2.40	2.40	3.10	2.30	1.40	0.50	1.40	3.70	1.40	0.80	1.00	
Flint silt	12.70	13.00	8.60	8.60	3.20	2.80	2.60	2.60	4.50	16.30	4.50	2.40	4.50	
Free sand	16.70	16.00	3.90	3.90	5.30	4.20	4.50	2.50	6.50	8.40	6.50	6.10	6.10	
Coarse sand	20.50	18.00	11.40	11.40	34.30	15.70	20.20	14.80	11.60	14.50	11.60	24.50	24.50	
Coarse gravel	26.50	20.00	27.90	27.90	45.80	39.10	47.70	44.50	32.70	31.70	41.20	41.20	41.20	
Fine gravel	18.00	23.30	31.10	31.10	37.50	36.80	37.50	33.10	28.10	17.80	17.80	17.80	17.80	
Water absorption	Nil	7.00	6.90	10.56	0.80	4.20	Nil	23.10	23.10	17.80	17.80	17.80	17.80	
Water absorption	42.50	34.00	83.00	85.00	39.00	34.50	20.00	24.00	33.50	51.00	38.00	38.00	38.00	
<b>Chemical Composition.</b>														
Organic matter and combined water	2.600	3.800	2.000	3.400	2.400	2.000	0.800	0.800	2.600	2.600	0.800	0.800	0.800	
Organic matter and combined water	8.600	14.800	9.200	8.400	7.800	7.200	2.600	2.000	6.400	8.600	3.400	3.400	3.400	
Oxide of iron and manganese	8.800	8.400	7.920	9.200	5.620	4.480	3.040	2.800	4.000	6.000	1.680	1.680	1.680	
Oxide of alumina	0.520	0.620	0.584	12.317	10.319	9.004	2.654	3.560	9.974	10.010	4.954	4.954	4.954	
Lime	0.520	0.620	0.584	12.317	10.319	9.004	2.654	3.560	9.974	10.010	4.954	4.954	4.954	
Magnesia	1.460	1.267	1.100	0.907	0.749	0.835	0.098	0.101	0.527	0.548	0.400	0.400	0.400	
Potash	0.324	0.510	0.247	0.810	0.887	0.705	0.154	0.034	0.640	0.618	0.116	0.116	0.116	
Sulphuric anhydride	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Phosphoric acid	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Chlorine silicate	0.154	0.179	0.077	0.266	0.077	0.258	0.097	0.252	0.236	0.095	0.041	0.041	0.041	
Chlorine silicate	0.015	0.020	0.013	0.020	0.017	0.013	0.013	0.023	0.114	0.045	0.016	0.016	0.016	
Containing nitrogen	0.170	39.330	68.890	63.290	71.500	74.500	90.248	90.148	77.530	70.970	81.970	81.970	81.970	
Equal to ammonia	0.015	0.020	0.013	0.020	0.017	0.013	0.013	0.023	0.114	0.045	0.016	0.016	0.016	
Lower oxide of iron	0.204	0.442	0.224	0.597	0.170	0.143	0.006	0.052	0.103	0.174	0.095	0.095	0.095	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.274	0.125	0.480	0.832	0.390	0.390	0.390	
Water	0.003	0.184	0.344	0.629	0.689	0.446	0.2							



Table VII.

	Clay.	Silic.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
<b>EASTERN PROVINCE.</b>							
1. Kanthalai ..	14	10	42	18	Nil	42	0.188
2. Do. ..	11	11	38	33	7	34	0.284
3. Pankulam ..	8	17	58	17	7	33	0.185
4. Do. ..	11	12	33	37	10	35	0.297
<i>Devilane.</i>							
5. Nuwaragalla ..	11	14	52	16	1	30	0.140
6. Do. ..	8	13	55	19	4	34	0.118
<i>Akkaraipattu.</i>							
7. Panama ..	2	7	68	22	Nil	30	0.078
8. Do. ..	2	6	59	30	23	24	0.062
9. Talipoda-athukadu ..	4	17	44	29	Nil	34	0.168
<i>Maha-oya.</i>							
10. Maha-oya ..	16	12	40	18	2	51	0.174
<i>Vakaneri.</i>							
11. Vakaneri ..	2	12	66	18	Nil	38	0.085
Average ..	8	12	50	23	5	36	0.160

  

	Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phos-phoric Acid.	Reaction P. H.
<b>EASTERN PROVINCE.</b>							
1. Kanthalai ..	0.520	1.469	0.324	0.019	0.154	0.0551	7.7
2. Do. ..	0.620	1.267	0.510	0.017	0.179	0.100	7.8
3. Pankulam ..	0.140	1.109	0.247	0.007	0.677	0.0913	7.4
4. Do. ..	0.820	0.907	0.610	0.015	0.256	0.009	7.4
<i>Devilane.</i>							
5. Nuwaragalla ..	0.360	0.749	0.587	0.021	0.077	0.0064	7.4
6. Do. ..	0.300	0.835	0.795	0.025	0.256	0.0064	7.2
<i>Akkaraipattu.</i>							
7. Panama ..	0.200	0.086	0.154	0.054	0.027	0.0038	6.3
8. Do. ..	0.160	0.101	0.054	0.006	0.256	0.0077	7.3
9. Talipoda-athukadu ..	0.420	0.547	0.540	0.021	0.230	0.025	7.6
<i>Maha-oya.</i>							
10. Maha-oya ..	0.740	0.317	0.448	0.0004	0.256	0.009	7.4
<i>Vakaneri.</i>							
11. Vakaneri ..	0.400	0.144	0.116	0.0112	0.090	0.0038	7.3
Average ..	0.425	0.685	0.371	0.0182	0.173	0.0079	—

Table G.

## EASTERN PROVINCE.

		Rainfall.		Elevation.		Growth.	
		Inches.		Feet.			
1.	Kanthalai	..	63.00	..	100	Ebony, sample plot	.. Inside
2.	Do.	..	63.00	..	100	—	.. Outside
3.	Pankulam	..	63.00	..	100	Halmilla, sample plot	.. Inside
4.	Do.	..	63.00	..	100	—	.. Outside
<i>Devilane.</i>							
5.	Nuwaragala	..	60.00	..	136	Satin, Milla, Teak, Ranai, Vida- panai, &c.	.. Inside
6.	Do.	..	60.00	..	136	—	.. Outside
<i>Akkarapattu.</i>							
7.	Panama	..	73.88	..	30	Palu, Milla, Satin	.. Inside
8.	Do.	..	73.88	..	30	—	.. Outside
9.	Talipoda-athukadu	..	73.88	..	30	Palu, Halmilla and Ranai	.. Inside
<i>Maha-oya.</i>							
10.	Maha-oya	..	75.36	..	190	Satin, Milla, Ranai, Halmilla, Panichchal, Vidapanai	.. Inside
<i>Vakaneri.</i>							
11.	Vakaneri	..	75.36	..	120	Satin and Ranai	.. Inside

## EASTERN PROVINCE.

(Table VII.)

The Eastern Province lies east of the Province of Uva and extends to the sea. Elevation at places of sampling 30 to 190 feet. Rainfall 60 to 75 inches. Eleven samples were examined.

Coarse gravel averages 5 per cent. for the Province, and varies from nil at Kanthalai (1), Panama (7), Talipoda-athukadu (9), Vakaneri (11), 1 per cent., Nuwaragala (5), 2 per cent., Maha-oya (10), to 23 per cent., Panama (8); the others vary from 4 to 10 per cent.

Coarse averages 74 per cent. for the Province, and ranges from 89 to 90 per cent., at Panama (7 and 8), 83 per cent., Vakaneri (11), to 60 per cent., Kanthalai (1), 64 per cent., Maha-oya (10); the others range from 68 to 74 per cent.

Fine gravel varies from 16 per cent. (5), 17 per cent. (3), 18 per cent. (1, 10, 11), to 37 per cent. (4), 33 per cent. (2), 30 per cent. (8), 29 per cent. (9), average 23 per cent. The sands vary from 33 per cent. (4), 36 per cent. (2), 42 per cent. (1), to 68 per cent. (7), 66 per cent. (11), 59 per cent. (8), average 50 per cent.

Silts average 12 per cent. for the Province, and varies from 19 per cent. at Kanthalai (1), 17 per cent. Talipoda-athukadu (9), Pankulam (3), to 6 to 7 per cent. at Panama (8 and 7); the others vary from 11 to 14 per cent. Clay averages 8 per cent. for the Province, and ranges from 16 per cent. at Maha-oya (10), 14 per cent. Kanthalai (1), to 2 to 3 per cent. at Panama (7 and 8), 2 per cent. Vakaneri (11), 4 per cent. Talipoda-athukadu (9), the others vary from 8 to 11 per cent. Water absorption averages 36 per cent. for the Province, and varies from 51 per cent. at Maha-oya (10), 42 per cent. Kanthalai (1), to 24 per cent. at Panama (8), 30 per cent. Panama (7); the others vary from 33 to 39 per cent.

Nitrogen averages 0.160 per cent. for the Province, and varies from 0.062 to 0.078 per cent. at Panama (8 and 7), 0.095 per cent. Vakaneri (11), to 0.364 per cent. at Kanthalai (2), 0.207 per cent. Pankulam (4); the others vary from 0.118 to 0.185 per cent. Lime averages 0.425 per cent. for the Province, and ranges from 0.820 per cent. at Pankulam (4), 0.740 per cent. Maha-oya (10), 0.620 per cent. Kanthalai (2), to 0.140 per cent. Pankulam (3), 0.160 per cent. Panama (8), 0.200 per cent. Panama (7); the others range from 0.300 to 0.520 per cent. Magnesia averages 0.685 per cent. for the Province, and varies from 1.469 per cent. to 1.267 per cent. at Kanthalai (1 and 2), 1.109 per cent. to 0.907 per cent. Pankulam (3 and 4) to 0.086 per cent. to 0.101 per cent. at Panama (7 and 8), 0.144 per cent. Vakaneri (11); the others vary from 0.317 to 0.835 per cent. Potash averages 0.371 per cent. for the Province, and varies from 0.587 per cent. to 0.795 per cent. at Nuwaragala (6 and 5), 0.610 per cent. Pankulam (4), to 0.054 per cent. Panama (8), 0.116 per cent. Vakaneri (11), 0.154 per cent. Panama (7); the others vary from 0.247 to 0.540 per cent. Available potash averages 0.0132 per cent., and ranges from 0.021 to 0.025 per cent. at Nuwaragala (5 and 6), 0.021 per cent. Talipoda-athukadu, to 0.0004 per cent. at Maha-oya (10), 0.0054 to 0.006 per cent. Panama (7 and 8); the others vary from 0.007 to 0.019 per cent. Phosphoric acid averages 0.173 per cent., and varies from 0.077 per cent. at Nuwaragala (5), Panama (7), to 0.256 per cent. at Pankulam (4), Nuwaragala (6), Panama (8), Maha-oya (10), the others vary from 0.090 to 0.230 per cent. Available phosphoric acid averages 0.0079 per cent., and varies from 0.0013 per cent. Pankulam (3), 0.0038 per cent. Panama (7), Vakaneri (11) to 0.025 per cent., Talipoda-athukadu (9); the others vary from 0.0051 to 0.010 per cent.

The reaction varies from 6.3 at Panama (7), the only acid soil examined, to 7.8 at Kanthelai (1). On an average the soils are alkaline.

## COMPARISON OF PROVINCES.

Table VIII.

PROVINCE.	Clay.	Silts.	Sands.	Fine Gravel.	Coarse Gravel.	Water Absorption.	Nitrogen.
I.—Southern	9	10	42	25	21	40	0.127
II.—Sabaragamuwa	8	20	31	31	13	37	0.209
III.—Central	10	22	30	25	3	50	0.325
IV.—North-Central	4	19	36	36	9	36	0.092
V.—North-Western	7	23	47	15	Nil	44	0.154
VI.—Uva	10	18	48	18	5	45	0.120
VII.—Eastern	8	12	50	23	5	36	0.160

  

PROVINCE.	Lime.	Magnesia.	Potash.	Citric Potash.	Phosphoric Acid.	Citric Phosphoric Acid.	Reaction P. H.
I.—Southern	0.161	0.190	0.165	0.0122	0.099	0.004	6.4
II.—Sabaragamuwa	0.211	0.252	0.311	0.019	0.132	0.0036	6.9
III.—Central	0.355	0.430	0.492	0.015	0.068	0.008	6.8
IV.—North-Central	0.290	0.237	0.329	0.011	0.096	0.0035	7.6
V.—North-Western	0.410	0.346	0.579	0.017	0.115	0.0045	7.5
VI.—Uva	0.225	0.183	0.336	0.021	0.102	0.004	7.0
VII.—Eastern	0.425	0.685	0.371	0.0132	0.173	0.0079	7.4

Table VIII. gives an average of the figures obtained from the different soils, tabulated in Provinces, so as to give a comparison of these.

The coarse gravel is highest in the Southern Province (I.) 21 per cent., Sabaragamuwa (II.) comes next with 13 per cent., the others vary from nil to 9 per cent.

“Coarse” (fine gravel and sands) varies from 55 per cent. Central (III.), 61 per cent., North-Western (V.), to 74 per cent., Eastern (VII.); the others vary from 66 to 71 per cent. Fine gravel varies from 15 per cent. (V.), 18 per cent. (VI.), to 36 per cent. (IV.), and 31 per cent. (II).

The sands vary from 30 per cent. (III.), 31 per cent. (II.), to 30 per cent. (VII.), 48 per cent. (VI.). Silts vary from 23 per cent. North-Western (V.), 22 per cent. Central (III.), to 12

per cent. Eastern (VII.); the others vary from 18 to 20 per cent. Clay varies from 10 per cent. Central (III.), Uva (VI.), to 4 per cent. North-Central (IV.); the others vary from 7 to 9 per cent. Water absorption ranges from 50 per cent. Central (III.) to 36 per cent. North-Central (IV.), Eastern (VII.), 37 per cent. Sabaragamuwa (II.); the others vary from 40 to 44 per cent.

The Eastern (VII.) and the North-Central (IV.) have the least fine soil—clay and silts—20 to 23 per cent. respectively, which is only about one-fifth of the whole, limiting the feeding surface and the moisture retained, after the soil mass is saturated with water and drained. The other Provinces have 28 to 32 per cent. of their weight fine soil, which gives a better feeding surface than above Provinces, and also a higher retention of moisture. Central Province (III.) has a higher proportion of fine soil (32 per cent.), and a higher retention of water figure than the other Provinces, the latter due to the organic matter as well as the fine soil present. The water absorption figures for the different Provinces are in the same sequence as the "fine" and "coarse" when the coarse gravel is taken into consideration. The soils can only be classified as a whole, as gravelly loams, there being only 20 to 30 per cent. "fine" and 60 to 80 per cent. "coarse," of which a large proportion is gravel.

PROVINCE.	"Fine."		"Coarse."		Water Absorption.		Sequence.
Central (III.)	..	31	..	57	..	50	1
North-Western (V.)	..	30	..	61	..	44	2
Uva (VI.)	..	27	..	69	..	43	3
Southern (I.)	..	23	..	80	..	40	4 and 5
Sabaragamuwa (II.)	..	24	..	76	..	37	
North-Central (IV.)	..	21	..	78	..	36	6 and 7
Eastern (VII.)	..	19	..	77	..	36	

The high proportion of coarse material makes the soil mass easily drained, the clay which controls the evaporation of moisture from the soil is low, the combination of the two would cause the soils to dry out quickly during drought.

Nitrogen is richest in the Central Province (III.) 0.325 per cent., Sabaragamuwa (II.) next with 0.209 per cent., lowest in the North-Central Province (IV.) 0.092 per cent., Uva (VI.) next lowest 0.120 per cent.; the others range from 0.127 to 0.160 per cent. The advantage of the cooler highlands of the Central Province is seen in the high nitrogen and organic

matter, where humus is not burnt out so quickly as in the lowlands with a hotter atmosphere, and in some cases a lower rainfall.

Lime is highest in the Eastern Province (III.) 0.425 per cent., followed by the North-Western (V.) 0.410 per cent., lowest in the Southern Province (I.) 0.161 per cent.; the others range from 0.211 to 0.355 per cent. Magnesia is highest in the Eastern Province (V.) 0.685 per cent., Central Province (III.) 0.480 per cent., lowest in the Uva (VI.) 0.183 per cent., Southern Province (I.) 0.190 per cent.; the others vary from 0.237 to 0.346 per cent. Potash is richest in the North-Western Province (V.) 0.579 per cent., followed by Central Province (III.) 0.492 per cent., the poorest supply of potash is found in the Southern Province (I.) 0.165 per cent.; the others vary from 0.311 to 0.371 per cent. Available potash varies from 0.021 per cent. Uva (VI.), 0.019 per cent., Sabaragamuwa (II.), to 0.011 per cent., North-Central (IV.) 0.0122 per cent.; Southern Province (I.); the others vary from 0.0132 to 0.017 per cent. Phosphoric acid is richest in the Eastern Province (VII.) 0.173 per cent., next Province of Sabaragamuwa (II.) 0.132 per cent., lowest 0.096 per cent. in the North-Central Province (IV.); the others vary from 0.098 to 0.115 per cent. Available phosphoric acid varies from 0.008 per cent., Central (III.), 0.0079 per cent., Eastern (VII.), to 0.0035 per cent., North-Central (IV.); the others vary from 0.0038 per cent. to 0.0045 per cent.

The Southern Province (I.) is more acid than the other Provinces, Sabaragamuwa (II.), Central (III.), Uva (VI.) have neutral soils. North-Central (IV.), North-Western (V.), Eastern (VII.) have alkaline soils.

Of all the Provinces considered, the Central Province soils have the largest feeding surface, the highest water retention, and the largest reserve of plant food.

Many of the areas outside the forest belt are proposed reserves.

The plant distribution of the forests as a whole is not dependent on soil compositions, but is more determined by climatic conditions, elevation, and rainfall, in particular rainfall (*vide* Trimen's "Flora of Ceylon," Vol. V., page 356, Appendix II.; on the Forests and Waste Lands of Ceylon, A. F. Broun, Conservator of Forests).

Thanks are due to the officers of the Forest Department for collection of samples and details, and also to Mr. Fred. Lewis, late of the Forest Department, for valuable information.

August 1, 1922.

ALEXANDER BRUCE.

## INDEX TO SINHALESE NAMES.

## A.

- An-kenda .. *Acronychia laurifolia* Bl.  
Aridda .. *Camposperma zeylanicum* Thw.

## B.

- |          |    |   |
|----------|----|---|
| Badulla  | .. | <i>Semecarpus coriacea</i> Thw. or <i>S. Gardneri</i><br>Thw. or <i>S. obscura</i> Thw. |
| Bakmi    | .. | <i>Artocarpus cordatus</i> Miq.   |
| Bedi-del | .. | <i>Artocarpus nobilis</i> Thw.  |
| Buruta   | .. | <i>Chloroxylon Swietenia</i> Dc. ( <i>Satin Wood</i> ).                                 |

## D.

- |           |    |                           |
|-----------|----|---------------------------|
| Damba     | .. | Eugenia Gardneri Duth.    |
| Dan       | .. | Eugenia corymbosa Lam.    |
| Del       | .. | Artocarpus nobilis Thw.   |
| Diwal     | .. | Feronia elephantum Corr.  |
| Diya para | .. | Wormia triquetra Rottb.   |
| Domba     | .. | Calophyllum Inophyllum L. |
| Dua       | .. | Doona zevania Thw.        |

**E.**

- Ebony .. *Diospyros ebenum* Koën. (Kaluwara).  
 Ehela .. *Cassia Fistula* L.  
 Et heraliya .. *Kurrimia zeylanica* Arn.  
 Etamba .. *Mangifera zeylanica* Hk. (Wild Mango).

**G.**

- |           |    |                             |
|-----------|----|-----------------------------|
| Goda para | .. | Dillenia retusa Thunb.      |
| Goraka    | .. | Garcinia Cambogia Desr.     |
| Guru-kina | .. | Calophyllum Burmanni Wight. |

**Н.**

- |          |    |  |
|----------|----|--|
| Halmilla | .. | Berrya ammonilla Roxb. (Trincomalee Wood). |
| Hedawaka | .. | Chaetocarpus castanocarpus Thw.            |
| Helamba  | .. | Stephegyne Ptubulosa Hk. f.                |
| Hora     | .. | Dipterocarpus zeylanicus Thw.              |

I.

- Iriya .. *Myristica Irya* Gaertn.

## K.

Kaju	..	<i>Anacardium occidentale</i> L.
Kalumaduwa	..	<i>Ficus nervosa</i> Heyne.
Kampotta	..	<i>Aporosa latifolia</i> Thw.
Katu-kenda	..	<i>Scolopia acuminata</i> Clos.
Kirihiriya	..	<i>Palaquium grande</i> Engl.
Kekuna	..	<i>Canarium zeylanicum</i> Bl.
Kekilla	..	<i>Gleichenia linearis</i> Clarke.
Ketakela	..	<i>Bridelia retusa</i> Spr.
Kina	..	<i>Calophyllum tomentosum</i> Wight
Kohomba	..	<i>Azadirachta indica</i> A. Juss.
Kon	..	<i>Schleichera trijuga</i> Willd.
Kos	..	<i>Artocarpus integrifolia</i> L. f.
Kududawula	..	<i>Litsea zeylanica</i> Nees.
Kumbuk	..	<i>Terminalia glabra</i> W. and A.
Kurundu	..	<i>Cinnamomum zeylanicum</i> Bl.

## L.

Lawulu	..	<i>Chrysophyllum Roxburghii</i> G. Don
Liyan	..	<i>Homalium zeylanicum</i> Benth.
Lunumidella	..	<i>Melia dubia</i> Cav.

## M.

Malaboda	..	<i>Myristica laurifolia</i> Hk. f.
Mara	..	<i>Albizia Lebbek</i> Benth.
Milla	..	<i>Vitex altissima</i> L. f.
Mora	..	<i>Nephelium Longana</i> Camb.

## N.

Na	..	<i>Mesua ferrea</i> L. (Iron Wood).
Nā-Imbul	..	<i>Harpulia imbricata</i> Thw.
Nedun	..	<i>Pericopsis Mooniana</i> Thw.
Netawu	..	<i>Xylopia Parvifolia</i> Hk. f.

## P.

Palu	..	<i>Mimusops hexandra</i> Roxb.
Panichchai	..	<i>Diospyros Embryopteris</i> Pers. (Timbiri).
Pehimbiya	..	<i>Filicium decipiens</i> Thw.
Pelan	..	<i>Putranjira zeylanica</i> Arn.
Pepiliya	..	<i>Aporosa latifolia</i> Thw.

## R.

Ranai	..	<i>Persea semecarpifolia</i> Trim. — <i>Alseodaphne semecarpifolia</i> Nees.
Ruk-attana	..	<i>Alstonia scholaris</i> Br.



S.

Siyambala	..	<i>Tamarindus indica</i> L.
Suriamara	..	<i>Albizia odoratissima</i> Benth.
Suriya	..	<i>Thespesia populnea</i> Sol. (Tulip Tree).

T.

Tawenna	..	<i>Cryptococcyx membranacea</i> Thw.
Teak	..	<i>Tectona grandis</i> L.
Tiniya	..	<i>Doona congestiflora</i> Thw.

V.

Vidpani	..	<i>Pityranthe verrucosa</i> Thw.
Vira	..	<i>Hemicyclia sepiaria</i> W. and A.

W.

Wal-jambu	..	<i>Eugenia aquea</i> Burm.
Welipenna	..	<i>Anisophyllea zeylanica</i> Benth.
Weralu	..	<i>Elaeocarpus serratus</i> L.

---

